



GOVERNMENT OF INDIA
MINISTRY OF TOURISM & CIVIL AVIATION
(COMMISSION OF RAILWAY SAFETY) L
RAILWAY ACCIDENT
INVESTIGATION

REPORT
ON
DERAILMENT
OF
94 DOWN JODHPUR MAIL
BETWEEN
TALCHHAPAR AND PARHIHARA STATIONS
OF
NORTHERN RAILWAY
ON
29TH MARCH, 1969

1970

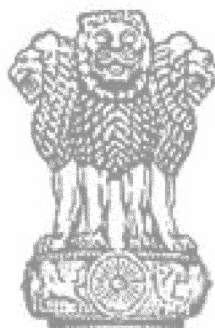
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CORRIGENDUM

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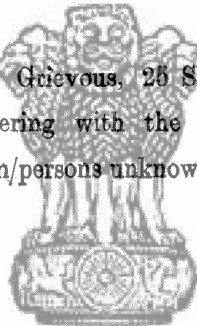
CORRIGENDUM



सत्यमेव जयते

SUMMARY

Date	29th March, 1969
Time	20.50 hours
Railway	Northern
Gauge	..	..	..	Metre
Location	..	..	..	Km 350 between Talchhapar & Parhihara Stations of Jodhpur Division.
Nature of accident	..	..	..	Derailment
Train involved	..	..	..	94 Down Jodhpur Mail
Consisting of	..	..	..	14 coaches hauled by a YP engine No. 2789.
Speed at the time of accident	..	..	..	About 42 Km. p.h.
System of operation	..	..	..	Absolute Block System with Neale's Ball Token type instruments
No. of tracks	..	..	..	Single
Gradient	..	..	..	1 in 900 rising
Alignment	..	..	..	Straight
Weather	..	..	..	Fair
Visibility	..	..	..	Clear
Casualties	..	..	..	29 (4 Grievous, 25 Simple)
Cause	..	..	..	Tampering with the track
Responsibility	..	..	..	Person/persons unknown



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF TOURISM AND CIVIL AVIATION
(COMMISSION OF RAILWAY SAFETY)

From

The Additional Commissioner of Railway Safety,
Northern Circle,
Lucknow.

To

The Secretary to Government of India,
Ministry of Tourism & Civil Aviation,
New Delhi.

(Through: The Commissioner of Railway Safety, Lucknow)

SIR,

In accordance with Rule 10 of the Railway Board's Notification No. 59-TTV/42/1 dated 11th April, 1966, I have the honour to submit the results of my inquiry into the derailment of 94 Down Jodhpur Mail between Talchhappar and Parhihara stations of Jodhpur Division of Northern Railway on 29th March 1969.

2. *Inquiry*—(a) I inspected the site of the accident, the affected coaches, the capsized engine, the permanent way, the points and crossings and the interlocking equipment, accompanied by the Divisional Superintendent, the Transportation Superintendent (Safety) and the Deputy Chief Signal & Telecommunication Engineer on the 31st morning. I again inspected the engine and the coaches as they were lifted and placed on the track and the interlocking equipment on the 1st and the 3rd morning. An experiment was conducted on 'E' type locks, similar to that used at the points at the site of the accident, at Parhihara & Balsamand stations on the 1st afternoon. The experiment was to investigate the possibility of unlocking the points by setting the locking piece in the unlocked position after removing the lock cover and the time required for this operation. I visited one injured passenger at Churu on the 2nd afternoon and two in the Central hospital of the Northern Railway at New Delhi on the 4th morning. They were well looked after and were progressing satisfactorily. No other injured passengers were available. A speed trial, according to my instructions, was conducted between Sujangarh and Talchhappar stations on the 1st night by 94 Down Jodhpur Mail having a similar composition and drawn by a similar engine. An experiment was also conducted at Delhi to find out the possibility of unlocking the 'E' type lock, without the use of its key, by applying external forces. I also discussed the behaviour of the 'E' type lock, used on the points at the site of the accident, with the Additional Director (Signal), Research, Design and Standards Organization on 17th April.

(b) The Inquiry was held at Ratangarh station on 31st March and 1st, 2nd and 3rd April, 1969. The following Officers were present during the Inquiry:—

- | | |
|--|------------------|
| (i) Shri P.N. Chopra, Divisional Superintendent, Jodhpur. | |
| (ii) Shri Y.B.L. Mathur, Transportation Superintendent (Safety), Northern Railway. | |
| (iii) Shri Swami Saran, Deputy Chief Signal & Tele-communication, Engineer Northern Railway. | |
| (iv) Shri V.K. Srivastava, Sub-Divisional Magistrate, Ratangarh | } On 1st
only |
| (v) Shri K.C.R. Bhandari, District Superintendent of Police, Churu | |
| (vi) Shri M.N. Dhawan, Deputy Superintendent of Police, G.R.P. Bikaner | |
| (vii) Shri Het Ram, Deputy Superintendent of Police, Ratangarh | |
- Other Divisional and Headquarters Officers of the Railway were called in as and when necessary.

(c) The District Magistrate, the District Superintendent of Police and the Superintendent of Railway Police were advised about my Inquiry. They or their representatives were present as indicated above.

(d) The evidence of 43 witnesses was recorded.

NOTE—(i) The terms 'right' and 'left', 'front' and 'rear', 'leading' and 'trailing' have been used in this Report with reference to the direction of motion of No. 94 Down Jodhpur Mail.

(ii) There are generally 16 telegraph posts per kilometre.

(iii) No. 94 Down wherever used means No. 94 Down Jodhpur Mail.

3. *The Accident*—(a) No. 94 Down left Talchhappar station at 20.37 hours—about 5 minutes late. It was travelling at about 42 Km. p.h. when it became derailed over an outlying facing point, K-1, between Talchhappar and Parhihara stations at about 20.50 hours. These facing points take off to the left from the main line, about 28' to the rear of Km. post 350, for a ballast siding. These are a part of a cross-over K-1=1-K, which isolates the main line from the ballast siding.

(b)(i)—Due to the derailment, engine No. YP 2789 capsized to the left and was found lying on its left side at an angle of 70° to the vertical. Its front end was about 11' and the rear end about 3' to the left of the centre line of the track. The front end had ploughed into the sandy bank to a depth of about 4". A mound of sand about 5' high was also piled up in front of the engine.

(ii) The tender had also capsized to the left and was lying on its left side more or less parallel to the track at a distance of about 2'—6" from the centre line.

(c) The first coach, VP 2449, was derailed of all its wheels. Its front end was about 8' to the left of the centre line and its rear end more or less in the alignment. It was slightly tilted to the left.

(d) The second coach, TLR 1696, was derailed of all its wheels. Its front end was more or less in the alignment while its rear end was approximately 9' to the left of the track. This coach was slightly tilted to the left.

(e) The third coach, GT 2615, was derailed of all its wheels and was lying across the track. Its front end was about 8' to the left and the rear end about 4' to the right of the track. This coach was slightly tilted to the right.

(f) The fourth coach, GT 2620, though derailed of all its wheels, was more or less in the alignment. It was tilted slightly to the right.

(g) The fifth coach, RA 011, was derailed of six of its wheels. Its front bogie was detached from the under-frame and was lying about 6" to the right of the centre line. The underframe was, however, resting on the bogie. Its rear bogie was derailed of its trailing pair of wheels to the left. The wheels were lying 18" to the left of the centre line. Its leading pair remained on rails. Its entire super-structure was swept off the under frame and was lying as a mass of debris to the right of the fourth coach, GT 2620. A large piece of its roof was lying inverted beyond the debris at a distance of about 20' from the centre line.

(h) The sixth coach, ST 1012, was completely capsized and was lying on its right side to the right of the track. Its front end was 25' and the rear end about 4½' to the right of the centre line. Both of its bogies were detached from the under frame. The front bogie was resting on the under frame of RA 011, near its rear bogie pivot. The rear bogie was lying vertical between the under frame of RA 011, and the capsized body of this coach.

(i) The seventh coach, FC 195, was derailed to the right of its front bogie. The front bogie was about 2' to the right of the centre line and was lifted off the rails by about 9" due to its front head stock mounting over the rear end of the under frame of RA 011. Its rear bogie remained on the rails.

(j) The engine, the tender and the five leading coaches remained attached to each other though the couplings were badly bent. The couplings, between the fifth and sixth, and the sixth and seventh coaches, were broken.

(k) The remaining seven coaches were on the rails and were undamaged.

4. *Casualties*—The accident occurred on a Saturday. According to the local superstition, it is not considered auspicious to travel towards the East on Saturdays. Therefore, the train was not crowded. Besides, of the front seven coaches which derailed or capsized, the first coach was a steel bodied anti-telescopic Bogie-Parcel-Van. Four others were also steel bodied anti-telescopic type. These, therefore, did not suffer much damage. The remaining two coaches—one an Inspection Carriage and the other a composite second and third—were wooden bodied with steel panelling and were heavily damaged. Both of these had a very limited number of passengers in them. The number of casualties, therefore, was light. In all, 29 passengers were injured of whom only 4 were grievous. There were no fatalities.

5. *The Train*—(a) No. 94 Down was drawn by a YP engine (4-6-2) No. 2789. It was manufactured by TELCO and was put into service on 30th July 1968. It was given 'E' scheduled attention on 29th December, 1968, 'C' schedule on 23rd March 1969 and boiler wash-out on 28th March 1969. It was fitted with a standard head-light in good working order. It was also fitted with a speed recorder.

(b) The train comprised 14 coaches marshalled in the following order—

VP	2449 Steel bodied anti-telescopic
TLR	1696 Steel bodied anti-telescopic
GT	2615 Steel bodied anti-telescopic
GT	2620 Steel bodied anti-telescopic
RA	011 Wooden bodied with steel panelling
ST	1012 Wooden bodied with steel panelling
FC	195 Steel bodied anti-telescopic
GTCNT	1084 Wooden bodied with steel panelling
GTCN	1096 Wooden bodied with steel panelling
CD	2472 Wooden bodied with steel panelling
GT	2651 Steel bodied anti-telescopic
GT	2619 Steel bodied anti-telescopic
GT	2616 Steel bodied anti-telescopic
TLR	1700 Steel bodied anti-telescopic

(c) All the coaches had received their POH on the due dates and none of them was overdue any periodical attention. They had received secondary train examination at Delhi on 27th and the primary attention at Jodhpur on 29th March.

(d) The train was fully vacuum braked and all the vacuum cylinders were in good working order. Its length was 960'—7½". Its weight and the brake power were 456 tons and 358 tons (or 78.3%) respectively.

(e) The seating capacity of the train was 584. It was estimated that there were about 450 persons travelling in it at the time of the accident.

6. *Damage*—(a) The detailment occurred when the train was travelling at about 42 Km.p.h. Most of the coaches involved in the accident were steel bodied anti-telescopic type. The damage suffered was, therefore, comparatively light. The damage to the engine, coaches, permanent way and interlocking equipment was—

(i) Engine No. YP 2789—Had its cow catcher bent, both right and left hand injector body broken, intermediate draw bar and rear buffer bent and speed recorder burnt. Both axles of its front bogie were bent.

(ii) Coach No. VP 2449—Had both its end panels damaged, head stock bent, roof bulged, centre buffer couplers bent and cross bars cracked.

(iii) TLR 1696—Had both its end panels badly damaged, roof bulged, both centre buffer couplers bent, both head stocks and longitudinal girder bent.

(iv) GT 2615—Had both its end panels damaged, both head stocks slightly bent, both centre buffer couplers cracked and roof slightly damaged.

(v) GT 2620—Had both its end panels damaged, head stocks cracked and both draw bars bent.

(vi) RA 011—Had its under frame badly bent at both ends, both its head stocks badly damaged its sole bar and longitudinal girders buckled, both its bogie frames bent and super-structure completely smashed.

(vii) ST 1012—Had both centre buffer couplers broken, sole bar bent, longitudinal girders buckled, vacuum cylinders broken and super-structure badly damaged.

(viii) FC 195—Had its front end panel dented and front head stock slightly bent.

(b) The permanent way for a length of about 320' was completely destroyed. The crossing was badly damaged, but the switch rails were, more or less, intact.

(c) The single lever operating the points was bent and the cast iron quadrant housing it was broken. The rodding operating the cross-over, compensator crank and the rod roller guides were damaged.

(d) The cost of the damage to the permanent way, the interlocking gear, the coaches and the engine was estimated at—

	Rs.
The engine	2,848
The coaches	1,56,968
Permanent way	12,750
Interlocking gear	440
Total ..	1,73,006

II. RELIEF ARRANGEMENTS.

7. (a) The accident occurred at 20.50 hours. Soon after, the Guard got down, took stock of the situation and informed Ratangarh, on the portable telephone, about the accident as he could not immediately contact Jodhpur control. The Station Master, Ratangarh immediately got in touch with the Assistant Medical Officer and the Civil hospital authorities at Ratangarh. The Doctors from the Civil hospital as well as the Assistant Medical Officer left Ratangarh by an Ambulance Car reaching the site at 22.45 hours.

(b) In the meanwhile, medical aid to the injured was organised at the site by the Assistant Operating Superintendent(G) who was travelling in the train. Three Doctors—Dr. S.M. Bajaj of Rohtak Medical College, Dr. Jaswant Purohit of M.G. Hospital, Jodhpur, Dr. Promod Kumar Agarwal of M.G. Hospital, Jodhpur, and one Sister incharge of F.S.I. ward of M.G. Hospital, Jodhpur Miss A. Dhillidose were travelling in the train. They were requested to render the first-aid and were given the Guard's first-aid box. All the injured passengers were attended to by these Doctors.

(c) The Ambulance car from Ratangarh arrived at the site at 22.45 hours and further medical attention, as was necessary, was given to the injured. At 23.45 hours, 9 injured passengers were sent to Ratangarh Civil Hospital by a jeep and the Ambulance car. They were admitted as in-patients in the Civil Hospital on arrival. Other passengers, who had received trivial injuries, proceeded to Ratangarh Station where they were again attended to by the Assistant Medical Officer and allowed to continue their journey.

(d) The injured passengers were served with tea, milk, drinking water etc., from the Dining car which was one of the underailed coaches.

(e) In the meanwhile, the medical van from Merta Road was ordered. It left Merta Road at 21.25 hours but was terminated at Khunkhuna, since it was no longer required at the site. Medical van from Jodhpur left at 22.25 hours and reached the site at 05.45 hours. This also was not utilised.

(f) The injured passengers who were admitted in the Civil Hospital at Ratangarh were later transferred either to the Central Hospital of Northern Railway at New Delhi or some other Hospitals at Jodhpur or Bikaner as desired by them. At the time of Inquiry, no injured passenger was available at Ratangarh.

8. *Restoration*—(a) The 7 unaffected rear coaches of 94 Down were pulled back to Talchhappar. The passengers were sent to Ratangarh by buses or by a Relief train which left the site at 1.00 hours and reached Ratangarh at 2.25 hours. From Ratangarh, these passengers were despatched towards Delhi by 4 BRR (Ratangarh-Rewari) Passenger which was detained at Ratangarh and was extended to run up to Delhi.

(b) The Guard of 94 Down, after the accident, contacted the control office on the portable telephone at 21.08 hours. Immediately after the information was received in the control office, all the Officers of Jodhpur Division were informed by the Deputy Controller. Orders were also issued immediately to a number of Relief trains from various places to proceed to the site. The time at which they reached the accident site is given below—

- (i) A Relief train from Merta Road left at 21.25 hours and reached the site at 4.25 hours.
- (ii) A Relief train from Ratangarh left at 22.25 hours and reached the site at 00.00 hours. This train was used to despatch the stranded passengers to Ratangarh.
- (iii) A Relief train with Medical van from Jodhpur left at 22.25 hours and reached the site at 5.45 hours.

- (iv) Another Relief train from Jodhpur with a 35 ton steam crane left at 23.05 hours and reached the site at 08.45 hours.
- (v) A Relief train from Churu arrived at site at 02.25 hours.
- (vi) Another Relief train with a 35 ton steam crane from Bikaner Division reached the site at 11.10 hours.
- (c) The disposition of the engine and the coaches was such that it was not possible to remove them and restore the main line quickly. A diversion was, therefore, laid and through communication restored at 20.25 hours on 30th March 1969. In the meanwhile, 3 passenger trains were either terminated short of their destinations or cancelled and 1 Mail train was diverted from Ratangarh to Jodhpur via Bikaner.

III. LOCAL CONDITIONS.

9. (a) The accident occurred between Talchhappar and Parhihara stations on the Ratangarh-Degana single line, metro gauge section of the Jodhpur Division. The Headquarters of the Division and the Control office are at Jodhpur. The headquarters of the Assistant Engineer is at Merta Road.

(b) At the time of the accident, it was a clear night with good moon light and the visibility in the head light was good.

(c) The alignment at the site of the accident is from South to North.

(d) The permanent way at the site consists of 60 lbs RBS rails, 12 metres long welded in panels of 3 rails each. Rails are laid on C.S.T. 9 sleepers to a density of N+3 with wooden sleepers at joints. The track is provided with $6\frac{1}{2}$ " broken stone ballast under the sleepers. The formation is made up of local sand and is well consolidated.

(e) The derailment took place, when the train was negotiating a 1 in 12 points, K-1, of a cross-over, K-1=1-K, connecting the main line to the ballast siding, in the facing direction.

(f) The points take off 28' to the rear of Kilometre post 350.

(g) The kilometerage is reckoned from Delhi Main station and the kilometerage of various stations mentioned in the report is as under:—

Churu	..	..	281.3
Ratangarh	..	..	324.33
Parhihara	..	..	344.19
Site of accident	..	..	350.01
Talchhappar	..	..	356.77
Sujangarh	..	..	370.16
Balsamand	..	..	389.50
Khunkhuna	..	..	426.94
Merta Road	..	..	520.85
Jodhpur	..	..	624.98

(h) After leaving Talchhappar upto the site, a Down train travels over a level stretch for 0.52 kilometres, then on a rising grade of 1 in 150 for 0.25 kilometres, then on a rising grade of 1 in 900 for 1.6 kilometres followed by a rising grade of 1 in 150 for 1.50 kilometres and then a level stretch of 1.24 kilometres followed by a rising grade of 1 in 900. The accident occurred on this rising grade of 1 in 900.

(i) Leaving Talchhappar, a Down train has to negotiate a 1° curve, 236 metres long from Km. 354/1 to 353/12. It has again to negotiate a 2° curve 302 metres long from Kms. 353/3-4 to 352/14. The alignment then is straight up to and beyond the point of derailment. The next curve, a 1° right handed, starts at 252' beyond the point of derailment.

(j) The alignment at the site of the accident is on a low bank about 2'-2" high.

(k) The maximum permissible speed of the section is 65 Km. p.h. There is a speed restriction of 48 Km. p.h. over the ballast siding points. A 'S' marker is provided near the points. A board indicating the speed restriction of 30 miles or 48 Km.p.h. is fixed 100' short of the 'S' marker post and a caution board has been provided half a mile in the rear of the speed restriction board. The 1 in 12 points and crossing taking off from the main line for the ballast siding consists of 60 lbs RBS rails laid on steel trough sleepers and are provided with 18' over-riding switches.

(l) (i) The points are in a facing direction for a Down train and the ballast siding is isolated from the main line through the cross-over which is operated by rodding from a single lever ground frame located 9' to the rear of the points on the right of the main line. The movement of lever is parallel to the track. The single lever works in a cast iron quadrant and is provided with a catch box which when pushed down engages in either position of the lever, with a suitable notch in the quadrant. It is also provided with slots in the quadrant through which a cotter can be inserted and the lever padlocked in either position. When the lever is pulled towards Talchhappar end, the main line points are set for the through line while the other cross-over points are set for the siding. The main line points are provided with a single hand plunger type key lock placed inside the track to lock the points switches rigidly through a split stretcher bar. The hand plunger has a stroke of $5\frac{1}{2}$ " and locks the facing points for the through line. The locking is done by means of a mild steel piece, 2.5" long, 1.375" wide and 0.5" thick fixed to the hand plunger, which enters a corresponding slot cut in the stretcher blades made of steel 0.5" thick and 3" wide. The hand plunger is of mild steel 2" wide and $\frac{3}{4}$ " thick with a cast iron handle. The plunger is held in the locked position by means of an 'E' type key, lock mounted on a cast iron base of the hand plunger lock. A notch $17/32$ " (0.57") wide (generally cut at site) is provided on one side of the hand plunger in which the lock bolt 0.5" thick (Thickness varied from 0.5" to 0.39") of the 'E' type lock engages and holds the hand plunger in the locked position. The lock bolt moves in a direction at right angles to the stroke of the hand plunger.

(ii) The 'E' type lock is $6\frac{1}{16}$ " long, $3\frac{11}{16}$ " wide and $3\frac{3}{16}$ " thick. It has a cast iron base and cover. The lock is fixed to the base by means of cheese head screws with their heads inside the lock. The cover is fixed to the base by means of 3 nuts screwed on to 3 studs about 0.375" diameter fixed to the base. In the cover, 3 radial notches are cut over a central hole $11/16$ " in diameter. The notches are $\frac{1}{2}$ " (0.53"), $3/8$ " (0.4") and $3/16$ " (0.24") wide. This is the key hole of the lock. It is covered with a cast iron lid. Inside the lock, is an operating piece with similar notches, made of cast iron. It is capable of rotating in the cover with the movement of the key. It has a $9/16$ " (0.5") \times $5/8$ " (0.62") \times $15/32$ " thick projecting piece which works in a cam path in the lock bolt. The lock bolt is made of mild steel 0.5" thick, 2" wide and $5\frac{3}{4}$ " ($5\frac{11}{16}$ ") long. To the bolt is fixed a $3/8$ " square steel piece on the opposite side to the one in which the operating piece moves. This piece engages in the notches cut in 3 cast bronze tumblers. Each tumbler is $\frac{1}{4}$ " thick, $2\frac{5}{8}$ " wide and 3" long. The tumblers are loaded with small helical springs pressing against a lug fixed to the cast iron base to ensure their proper operation. A special 'E' type key is used for operation of this lock. The key is 7" long having $2\frac{11}{16}$ " long operating portion. From the operating end, $\frac{1}{2}$ " thick ward extends for a length of $\frac{3}{4}$ " on which are cut 3 key combinations each $\frac{1}{4}$ " wide. There are two radial projections near the operating end—one $3/16$ " thick named feather and the other $3/8$ " thick named lug. These projections, $3/4$ " in length and $3/8$ " in height, begin at $1\frac{5}{16}$ " from the end of the key and extend up to $2\frac{1}{16}$ ". The feather and the lug engage in the operating piece within the lock. Depending on the radial position of the feather, the lug and the height of the wards which operate the tumblers, 42 combinations have been evolved and one of these is used at any given location.

(iii) The key can enter the lock only when the lock is in a locked position. The key is then turned clockwise. When the key is turned, the wards are checked by the tumblers and if this is correct the tumblers move and free the hold on the $3/8$ " square metal projection of the lock bolt. Simultaneously, the operating piece rotates and works in the cam path provided in the lock bolt. The lock bolt then moves in a straight line path towards the inside of the lock. The stroke of the lock bolt is about 1". When the lock bolt is thus operated, the hand plunger is unlocked and is free to be moved and the points, if required, can be turned by the operation of the points lever. In this position, the lug and the feather of the key are turned away from the notches cut in the lock cover and, therefore, the key cannot be extracted from the lock.

NOTE—Dimensions in the bracket are actual dimensions of the lock components used at the site.

Where no dimensions in the bracket are given the actuals correspond to the design.

(m) The section is worked on Absolute Block System and the token instruments used are Neale's Ball token type. The ballast siding is provided at site with a key transmitter, a token exchanger and a telephone connected with Talchhappar station. The token exchanger, the telephone and the key transmitter are housed in a padlocked metal location box situated on the left of the main line near the points. Similar token exchanger, key transmitter and telephone are also provided in the Station Master's office at Talchhappar station.

(n) Briefly, the method of working the ballast siding is as follows:—

(i) When a ballast train has to enter the ballast siding, the section Talchhappar-Parhihara is blocked, the ballast train driver is given the token applicable to this block section, and the Guard is given the key of the padlock of the location box in which the token exchanger etc., are housed, by Station Master, Talchhappar. The train is brought to a stop short of the ballast siding points. The

Guard then opens the location box and inserts the token in the token exchanger, thereby releasing the key of the hand plunger lock fitted to the points. With this key, the hand plunger lock of the siding points is unlocked. The points which form a part of the cross-over are reversed, and set for the ballast siding by reversing the lever provided near by. The ballast train is then worked into the siding. After the ballast train has entered the siding, the points are again reversed, set and locked for the main line releasing the key of the hand plunger lock. The key is then inserted in the key transmitter and transmitted to Talehhapar station. At Talehhapar station, a corresponding key is recovered from the transmitter and inserted in a token exchanger provided at that station releasing a token applicable to Talehhapar-Parliihara section. This token is then inserted in the token instrument of this section, the section closed and normal working resumed.

- (ii) When the ballast train has completed its work and has to come out, it is stopped short of the crossover points of the ballast siding. The Guard opens the location box and contacts Talehhapar station on the telephone asking permission for the ballast train to enter the block section. If the block section is clear, the Station Master, Talehhapar blocks the Parliihara-Talehhapar section and extracts the token from his token instrument. This token is inserted in the token exchanger at Talehhapar station and the key released. It is then transmitted through the key transmitter to the site. At the ballast siding, the key is removed from the transmitter and the points are unlocked and reversed. The ballast train is then brought on the main line. The points are then re-set to the main line and locked. The key of the hand plunger lock is then removed and inserted in the token exchanger. This releases the token for Talehhapar-Parliihara section, the key remaining locked in the token exchanger. The token is handed over to the driver, as his authority to proceed. The ballast train then clears section either at Talehhapar or Parliihara. The token brought by it is used to close Talehhapar-Parliihara section. After reaching the station, the Guard, in addition, gives a certificate to the effect that the points have been correctly set and locked for the main line.

(o) The country side is undulating sandy desert with very sparse vegetation and is thinly populated. The nearest village is about 5 kilometres away. There is a Tar road about 200' from the site of the accident. This connects Ratangarh with Sujangarh.

IV. SUMMARY OF EVIDENCE.

10. (a) *Shri Bansi Lal, Guard B of 90 Down* stated that his train left Talehhapar at 20.37 hours. It was proceeding normally when he suddenly felt a jerk and found that his train had come to a stop. Immediately after the train came to a stop, he walked towards the engine and found that 7 coaches in front had either derailed, capsized or smashed. The engine of his train had also capsized. He then went back shouting for doctors and brought out his first-aid box from the brake-van. He handed over the first aid box to some doctors who were travelling in the train to render first-aid to the injured. In the meanwhile, he got in touch with Ratangarh and the control office at Jodhpur through the portable telephone. According to him, the speed of the train at the time of the accident, was about 45 to 50 Km.p.h. He had noticed the time immediately after the train came to a stop and stated it to be 20.50 hours. When he enquired from the driver about the cause of the accident, the driver informed him that when his engine came to the points it went down and he did not know how the accident occurred. He had no emergency lighting equipment in his brake-van.

(b) *Shri Ishwari Prasad Driver of 94 Down* stated that he was running 5 minutes late when he left Talehhapar. The speed, according to him, was 40 to 42 Km.p.h. and his speedometer was in good working order. As soon as he approached the caution board, he had closed the regulator to control his speed since there was a speed restriction of 48 Km. p.h. over the points. As soon as he came to the points, he heard a roaring sound and felt that his engine had derailed. He immediately applied the vacuum brakes. In the meanwhile, the engine capsized and the flames from the fire box came into the cab. He noticed the time immediately after the accident and it was 20.50 hours. His engine was in good working order. He had adequate brake power and the head light was properly burning. Before taking over, he had examined the engine and the repair book and found that all the repairs had been properly carried out and that the engine was in good working order. The driver was asked the type of jerk he felt when the engine derailed and he described, "It just went down". He had never felt any jerk on these points on any of his previous trips. He stated that if there was a gap in the points he would not be able to notice it in the engine head light running at his speed.

(c) *Shri Megha Ram, Fireman 'B' of 94 Down* stated that the train was travelling at about 40 Km. p.h. when the accident occurred. The regulator at the time of accident was closed and as he approached the ballast siding points, he suddenly heard a noise and found that the engine was tilting. The flames then came in the cab from the fire box and he managed to escape through the tender door.

(d) *Shri Mukhtiar Singh, Second Fireman of 94 Down* stated that the train was travelling at a normal speed. Soon after the accident, he was asked by the Assistant Mechanical Engineer to watch the points where the train had derailed and not to permit anybody to approach near it. He did it for about an hour after which he left as he started feeling cold.

(e) *Shri Raj Kishore Singh, Guard of ballast train* stated that his train left the siding at 17.45 hours reaching Talchhapar at 18.05 hours. The ballast siding points were working properly and did not give any trouble for setting or locking. He had checked the ballast train formation before he started from the ballast siding and had found nothing wrong with the formation. When he left the siding, the entire points equipment was intact except the plunger handle which was broken.

(f) *Shri Hari Ram, Driver of ballast train* stated that he came out of the ballast siding on the Guard's signal. After the train came out, the Guard set the points and extracted the token and gave it to him. While entering or leaving, the ballast siding, he did not feel any jerk.

(g) *Shri Prem Singh, Guard of J/4 Down Goods train* stated that his train left Talchhapar at 19.10 hours and arrived Parhihara at 19.35 hours. While passing over the points, he did not feel any jerk or lurch. He had examined his train at Sujangarh and found it to be completely intact. No part of the undergear of any vehicle was hanging which could have come in contact with the points gear.

(h) *Shri Bhagwana, Driver 'C' of J/4 Down goods train* stated that he did not feel any jerk on the ballast siding points.

(i) *Shri Dev Narain, Guard of 1 JRM Up Passenger of 29 3 69* stated that his train left Parhihara at 18.30 hours and arrived Talchhapar at 18.48 hours. While passing over the ballast siding points, he did not feel any jerk.

(j) *Shri Tara Singh, Driver of 1 JRM Up Passenger* stated that his train was running at normal speed and while passing over the ballast siding points, he did not feel any jerk.

(k) *Shri Shyam Behari Singh, Assistant Station Master, Talchhapar*, stated that at about 21.00 hours, Station Master, Parihara inquired from him the whereabouts of 94 Down, which should have passed his station by then. While they were talking on the phone, they heard the guard of 94 Down giving the accident message. He, therefore, called the Station Master and arranged for a relief train and an ambulance car from Ratangarh. According to him, the ballast siding points have never given any trouble previously.

(l) *Shri Bhim Singh, Pointman, Parhihara* stated that he went to the site of the accident at 10.00 hours on 30-3-69. When he was at the site, the key of the points was removed from the token exchanger and he was instructed to insert it into the lock fixed to the ballast siding points. He tried to approach the lock from the facing direction, but as there was a derailed bogie close to the points, he was unable to do so. He, therefore, approached the lock from the rear by lying flat between the track and tried to insert the key. The lock was in an unlocked position and the plunger was pulled out. The key, therefore, could not be inserted.

(m) *Shri Samdar Singh, Key man of gang no. 16* stated that he inspected the points and crossings and the track in the vicinity on the 29th morning and found everything intact. In fact, he had never found any components slack or missing in this area.

(n) *Shri Chunia, Mate of gang no. 16* stated that the last time his gang worked in this portion was in January, 1969, when slack packing was done. Since January 1969, he did not work at the site of the accident.

(o) *R. S. Garg, Permanent Way Inspector, Sujangarh* stated that he had inspected the track at the site of the accident by engine on 13th and again on the 14th and by trolley on 27th March, 1969. During his inspection, either by trolley or engine, he had found nothing wrong at the site. According to him, this portion was not difficult to maintain. The points were inspected by him in detail on 27th February, 1969. He did not find anything wrong with the points.

(p) *Shri Shri R. K. Tandon, Assistant Engineer, Merta Road* stated that he has inspected the track where the accident occurred by motor trolley on the 9th and by foot plate on the 23rd March, 1969 and on both occasions, he found nothing wrong. The track was relaid with all new material in May and June, 1968. The points and crossings were also relaid with new material on 23-11-68.

(q) *Shri Joginder Singh, Assistant Block Inspector, Merta Road* stated that he reached the site of the accident at 12.43 hours on 30-3-69. He found that there was no damage to the location box. He had inspected the token exchanger on 7th March, 1969 and it was functioning satisfactorily.

(r) *Shri Jagdish Dass, Block Inspector, Jodhpur* stated that he inspected the token exchanger on 31-3-69 and found it in good working order.

(s) *Shri Roop Singh, Mechanical Signal Maintainer, Sujangarh* stated that he inspected the points on 7th March, 1969. He cleaned and oiled the points on that day but did not open the lock.

(t) *Shri Ganga Ram, Assistant Signal Inspector (East), Merta Road* stated that he inspected the ballast siding points on 25-3-69. On that occasion, he checked the nuts and bolts, the plunger, the stretcher bar and the rodding. He also tested the lever and found everything in order. He had also tested the lock and other equipment on 7-3-69. Prior to that on 14-2-69, he had opened out the entire assembly, cleaned and put it back.

(u) *Shri D. D. Prabhakar, Signal Inspector, Jodhpur* stated that he reached the site of the accident at 11.00 hours on 31-3-69. When he reached the site of the accident, he found that the hand plunger lock was free and in an unlocked condition. The siding points, K-1, were gaping but there was no damage to the hand plunger lock. The arc lever was bent and the side quadrant casting on the off side was broken. Some of the lever rodding was broken and points, 1-K, were in a reversed position. He had inspected these points on 7-3-69. He had inspected them also on 14-2-69 when the lock was opened out, cleaned, tested and put back. On both the occasions, it was in good working order. According to him, the lock cannot get unlocked due to vibrations or by a hit from a passing rolling stock part. When questioned if the points can remain unlocked without the key in the points lock, he stated that it was not possible unless somebody interferes with the lock. To bring about this position, all that is necessary is to unscrew the three nuts holding the lock cover, remove the lock cover, shift the locking bolt to unlocked position, turn the operating piece and put the cover back and screw it on again. He did not consider it possible for the operating piece to turn through 180° due to any effect of the accident. If at all due to the accident the lock casting may break but it would not permit the locking piece to move or the operating piece to turn. According to him, any person who has watched the mechanism of the lock while it is being cleaned can manage to unlock it in about 3 to 4 minutes.

(He demonstrated it and it was found that it could be done in 3½ minutes.)

(v) *Shri S. P. Paul, Divisional Signal & Telecommunication Engineer, Jodhpur* reached the site of the accident at 12.43 hours on 30-3-69. At the site he found that the left hand switch of points K-I was gaping $\frac{3}{4}$ " and the right hand switch $3\frac{1}{4}$ ". He found the lock plunger in an unlocked position and free to be operated. He also observed the damage to the signal rodding, cranks, the arc lever and its quadrant. He checked the token exchanger, the key transmitter and the telephone and found them in good working order. He also noticed no damage to the hand plunger lock from outside. He had inspected the lock on 7-3-69 and had found it satisfactory. He was of the opinion that unless somebody interferes with the lock, the key must remain in the lock when the lock is in an unlocked position. According to him, to unlock the 'E' type lock, without the key, it will be necessary to carry out the operations as described by Signal Inspector D. D. Prabhakar. He has never come across a case when such a thing had happened i.e., the key being out with the lock in an unlocked position. He had examined the broken quadrant of the points lever and it appeared from the breakage as if the lever was floating on the quadrant instead of being firmly held by the catch box against the recess provided in the quadrant. There had been no failure of the points or the interlocking equipment connected with them since it was installed.

(Verification of the Signal Failure Register proved this statement to be correct.)

(w) *Shri Swami Saran, Deputy Chief Signal & Telecommunication Engineer, Northern Railway* has described the working of the lock in detail. In his opinion, it is not possible for the lock to remain unlocked and still the key to come out unless it is interfered with. He does not consider that there is any possibility of an accident occurring on account of speed even if a train passes over these points at 75 Km. p. h. as the lock is sufficiently strong for permitting 75 Km.p.h. over these points. All that is necessary, in addition, is detection of the points and provision of signals, the strength of the lock remaining the same.

(x) *Shri P. C. Bhattacharya, Chief Signal & Telecommunication Engineer, Northern Railway* reached the site of the accident at 10.30 hours on 30-3-69. When he arrived, he found the points unlocked and gaping. The key, however, was not in the points but was locked in the token exchanger. The key from the token exchanger was obtained and an attempt was made to insert the key in the lock. It was found impossible to do so. He again inspected the interlocking gear of the points on 2nd. After inspecting the points and the lock minutely, he was of the opinion that the position as was obtaining on the day of the accident could only be due to some outside interference with the lock. According to him, for creating the conditions, as were seen on the day of the accident, operations as described by the Signal Inspector were all that were required. An intelligent person observing the fitting of the lock, for 2 to 3 times, can easily manipulate it to create similar conditions in about 5 minutes. The conditions, as were obtaining at the site of the accident, could not be brought about by the accident itself. They must have been the result of some un-authorised interference. There are instructions to burr the lock bolts but in the Jodhpur Division where due to sand blowing it is necessary to open and clean the locks very often, this is not being done. According to him, the lever also should have been locked with a padlock but apparently at the site of the accident, this also was not done.

(y) *Shri R. S. Endlaw, Assistant Loco Foreman, Jodhpur* stated that the engine was put in service on 31-7-68 and had received its due scheduled attentions. He checked the tyre flanges and found them to be well within permissible limits. He had checked the repairs booked on this engine on the previous trips and found that all had been attended to. He also checked the repeated bookings register and found that there was no repeated booking which could render the engine unroadworthy.

(z) *Shri S. D. Tripathi, Train Examiner, Ratangarh* stated that he examined J/4 Down Goods on 29-3-69 when it arrived at Ratangarh. His examination did not reveal that there was anything wrong with any of the wagons which could have interfered with the ballast siding points.

(aa) *Shri W. C. Tuli, Train Examiner, Delhi* stated that the rake was given its secondary attention at Delhi on the 27th when it left as 93 UP. None of the coaches required any major attention and whatever minor attention was necessary was given.

(The Daily Damage Register of Delhi was examined and this was found to be correct.)

(bb) *Shri Bawa Singh, Train Examiner, Jodhpur* stated that the rake of 94 Down was given its primary maintenance at Jodhpur on 29-3-69 prior to its departure. He had examined all the coaches in detail and found them to be in perfectly roadworthy condition.

(The Daily Damage Return of Jodhpur was checked and it was found that all the minor attentions that were necessary had been given to the rake.)

(cc) *Shri Shyam Sunder, Assistant Mechanical Engineer (II) Jodhpur* stated that at about 20.50 hours the coach, FC 195, he was travelling in, received a jerk and he immediately surmised that it must have derailed and got up to pull the alarm chain. In the meanwhile, the train came to a halt. After he got down, he saw that a small fire had started near the debris of RA 011. He brought the fire extinguisher from the Guard's brake-van and put out the fire with the help of some passengers. He then went round and while examining the points found that there was a gap of 3/4" in the left hand switch and the stock rail and there were flange marks on the fastenings of the switch rail. He then asked the second fireman to stand guard near the points so that nobody may interfere with them. According to him, the accident occurred at 20.50 hours when the train was travelling at a speed of about 40 Km. p.h. He noticed the gaping points about half an hour after the accident. He could not approach the lock to examine it more closely from the front as the derailed bogie of GT 2620 was very close to the points and there was not enough room to approach the points from that direction.

(dd) *Shri G. K. Malkotra, Divisional Mechanical Engineer, Jodhpur* stated that he checked the flange thickness and other details of the engine as well as the rolling stock at the site of the accident as they were being rerailed. He found no defects in any coach or the engine which could have led to the derailment. The engine was commissioned in July, 1968 and he had travelled on the engine on 21-3-69. According to him, there was nothing wrong with the engine.

(ee) *Shri R. B. Jain, Assistant Commercial Superintendent, Jodhpur* was travelling in FC 195. At about 20.50 hours, he heard rattling noise and the train came to a stop. As soon as the train stopped, he alighted and found that all coaches in front of the FC had either derailed or capsized. He then arranged for rescue operation with the aid of the passengers and also for first aid to be given by three Doctors and a Nurse who were travelling in the train. He also ordered tea and other refreshments to be served to the passengers from the dining car which was the tenth coach of this train. The speed of the train at the time of the accident was normal.

(ff) *Dr. Arun Kumar, Assistant Medical Officer, Ratangarh* stated that he reached the site at 22.45 hours by Civil hospital ambulance. 9 cases which were considered to be serious were sent by a jeep and an ambulance after giving first aid, to Ratangarh Civil hospital at 23.45 hours. After the cases had been admitted in the Civil hospital and given further attention, he went to the station and attended to the minor injury cases and gave them such additional medical aid as was necessary.

(gg) *Shri P.N. Chopra, Divisional Superintendent, Jodhpur* stated that he reached the accident site at 05.45 hours on 30-3-69. When he reached the site, he found the points gaping and the marks on the track indicated that the engine and coaches had taken 'no road'. He surmised that it might be due to damage to the lock. He, therefore, instructed that the two trains which passed the points prior to the Jodhpur Mail i.e. J/4 Down Goods and 1 JRM Up Passenger should be thoroughly checked to see if any hanging part of any vehicle had interfered with the points and has subsequently found that no such possibility existed. According to him, there had been no attempts at train wrecking recently in that Division and there had been no occasion to provide any security patrol in that area except once during the political agitation in connection with 'Rajasthan Bund'. Since then, there was no occasion nor have the Civil authorities indicated the necessity for introducing patrolling.

V. INSPECTION AND TESTS.

11. (a) The derailed engine and the coaches, were inspected and the damage suffered by them and their disposition after the accident has already been described. The coaches were further examined as they were lifted and put on rails. The wheel gauge, the axle box clearances and the brake gear of all coaches were examined in detail and it was found that there was no damage or defect in them other than that caused by the accident. The wheels were checked for sharp or deep flanges and none of the coaches had any. The engine was also examined as it was lifted and it was found that there was no sharp or deep flange on the engine. The axle box clearances were checked and were found to be within the permissible limits. The engine was then taken to Jodhpur shops and was examined in detail. It was found that the wheel tread diameter, the thickness of tyres, the clearances of axle boxes, bearing spring cambers, control springs and the **buffer heights were all well within the permissible limits.** The wheel gauge of all wheels was within the permissible limits except the wheel gauge of the front bogie. The wheel gauge of the wheels of the front bogie varied up to 3 mm around the circumference. This was found to be due to the bent axles of the front bogie. The wheel profile showed no differential wear which would have been noticeable had the axle been bent prior to the accident. Therefore, it is evident that the bend in the axles of the front bogie was due to the accident.

(b) Most of the wheels of the engine as well as the wheels of the four leading coaches showed scoring marks on the inside surface indicating that they had been forced through a gap between two metallic surfaces.

(c) The 'E' type lock provided on the points was in an unlocked condition with the hand plunger pulled back and the steel piece disengaged from the split stretcher bars. The key of the lock was found locked in the token exchanger. The lock was dismantled and examined. The examination revealed that no part of the lock was in any way damaged. The operating piece however, was turned through 180° consistent with the unlocked position of the locking piece. The 3 studs used for fixing the lock cover were undamaged and did not show any sign of any attempt at burring or sealing. The stretcher bars were intact. An examination of the broken surface of the cast iron handle of the plunger indicated it to be an old break and was of no consequence.

(d) The single lever in the ground frame operating the cross-over was bent at right angles away from the track and the catch box was in a fully lifted position. There was a severe hit on the lever about 15½" from the bottom of the fully lifted position of the catch box. The hit mark was about 1¼" long and was on the side away from the catch handle. The off side part of the quadrant in which the lever works was broken, but the recess provided for housing the catch box did not show any sign of damage indicating that the catch box was not housed when the quadrant got broken.

(e) The lock on the facing points could not be approached from the facing direction as the leading pair of wheels of the rear bogie of GT 2620 had derailed to the left and was resting between the first sleeper under the toe of the switches and the sleeper in the rear. The trailing pair of wheels of this bogie 6'-6" to the rear of the front pair had also derailed to the left. The space between the steel trough approach sleepers of the points and the brake cross beam of the derailed bogie was less than 8" at a distance of 3' from the front axle. The space got further reduced where the anchor links and the steel plunger of the bogie were connected. It was not possible, therefore, to approach the lock from the facing direction.

(f) The lever working the points was provided with a hole to which a cotter should have been attached by a chain. This cotter could be inserted through a slot in the quadrant casting and padlocked in either position of the lever. When thus padlocked, the lever cannot be reversed and the points operated. However, the chain and the cotter both were missing and the lever was not provided with a padlock.

(g) The compensating crank in the rod run from the lever to the cross-over points of the siding was broken. The rodding itself was broken and was pulled forward by the engine. This reversed the turn out points, 1-K, on the ballast siding.

(h) The tip of the switches of points, K-1, were intact and did not show any wear or any damage due to the accident. The tongue rails were very slightly bent indicating that they were not subjected to any excessive pressure or hitting. The non-running sides of both the tongue rails showed severe rubbing marks from about 2' from the tips up to the heel blocks indicating that the wheels while passing through the gap had rubbed against the tongue rails. A corresponding rubbing mark was seen on the inside of wheels of the engine and four leading coaches.

(i) The two pairs of mild steel stops of the switches fixed on either stock rails showed flange marks. The second distance block on either side also showed flange marks. The third and the fourth distance blocks were broken by the wheels passing over them. The permanent way beyond this point was completely destroyed. The sleepers behind the heel of the switches had numerous wheel marks on them. They were also broken or displaced from their original position. All the rails from the heel of the switches up to the point where the tender came to a rest, were completely distorted and some of them were broken. Some rails of the turn out also had been broken indicating clearly that the breakage or distortion of the rails was the result of the derailment. The points and crossing, 1-K, of the siding was intact.

(j) An attempt was made on a similar lock to take out the key forcibly with the lock in an unlocked position but the key could not be taken out; it only got bent.

(k) Another attempt was made to see if the locking piece could be forced back by applying force to the hand plunger and it was found that no amount of force applied in any direction to the hand plunger or any other point of the lock or its casting could force the locking piece to the unlocked position. The only result was that the casting was broken.

(l) A test was also conducted to find out a method by which a points lock can be unlocked, the key taken out, and also to ascertain the time that would be necessary for this operation. This experiment was conducted on three similar locks—two at Parhihara and one at Balsamand. It was observed that with a suitable spanner, three nuts holding the lock cover in position could be easily unscrewed, the locking piece taken out and fixed in the unlocked position, the operating piece turned through 180° to correspond with the unlocked position of the locking piece and the cover refixed, in $3\frac{1}{2}$ minutes by a person who has some knowledge of the operation of such a lock.

(m) This hand plunger lock was tested and found to be working satisfactorily. There was no difficulty in locking or unlocking nor was there any difficulty in inserting or removing the key when the lock was in a locked position. The locking piece held the plunger correctly. The plunger could be moved freely and engaged in the split stretcher bars as required. Various parts of the lock were dismantled and measured. It was found that they were not worn and corresponded closely with the designed measurements.

(n) A speed test was conducted on the 1st April by 94 Down having a similar composition and drawn by a similar engine between Sujangarh and Talchhappar stations to ascertain the maximum speed that could be attained by a similar train in a distance travelled by this train from Talchhappar to the point of derailment. It was found that with maximum of effort and on easier grades, the train could attain a speed of about 60 Km. p.h.

(o) The speed recorder fitted in the engine of this train could not be examined since the speed recorder as well as the speedometer got burnt due to flames from the fire box. The speed records of Down Jodhpur Mail trains obtained on 15 occasions immediately prior to the accident were examined and it was found that on 10 occasions, the Mail trains had passed over these points at speeds between 40 to 45 Km. p.h. and on 5 occasions between 45 to 50 Km. p.h. On no occasion, the speed exceeded 50 km. p.h. indicating that the speed restriction is generally observed.

(p) The permanent way ahead of the accident site as well as in the rear was inspected. Detailed measurements of levels and gauge were taken for a length of 1045 sleepers behind the point of derailment and it was found that the maximum variation of level was $1/8"$. The maximum variation of gauge was also found to be $1/8"$. The packing was tested at various places on the approach and was found to be satisfactory. The alignment was good. In general, the maintenance of the permanent way was up to the required standard.

VI. DISCUSSION.

12. *Time of the Accident*—The train left Talchhapar station at 20·37 hours. It had travelled a distance of about 6·75 kms. when it met with the accident. The running time allowed between Talchhapar and Parhihara to cover a distance of 12·58 Kms. is 23 minutes and it had covered, more or less, half the distance on the rising grade. From this point onwards up to Parhihara, the grade is generally falling. The driver and the guard of the train have stated the time of the accident to be 20·50 hours. The Assistant Mechanical Engineer and the Assistant Commercial Superintendent, who were travelling in the train and had noted the time immediately after the accident have also stated it to be 20·50 hours. Considering all this evidence, I accept that the accident did occur at 20·50 hours.

13. *Speed of the Train*—The maximum permissible speed of the section is 65 Km. p.h. The train had been running about 5 minutes late consistently from Degana through most of the stations up to Talchhapar. This indicates that the driver was strictly observing the running time permitted and was not making any attempt to make up the lost time. Recovery time of 13 minutes is provided between Talchhapar and Ratanagarh. The driver, therefore, had ample margin to make up 5 minutes without exceeding the speed limit. The examination of speed records of 94 Down trains for 15 days prior to the accident, revealed that the speed restriction of 48 Km. p.h. over these points had invariably been observed. Not even in one case was there any violation of this speed restriction. The driver stated that the speed of his train, at the time of the accident, was about 40-42 Km. p.h. and he had closed the regulator while approaching the points. The guard estimated the speed to be between 45-50 Km. p.h. Shri Shyam Sunder, Assistant Mechanical Engineer, estimated the speed of the train to be about 40 Km. p.h. Special trial conducted on a train with similar composition and drawn by a similar engine indicated that excessive speed could not be reached under the conditions obtaining at the site. Taking into consideration all these factors and the time it has taken to travel from Talchhapar up to the site of the accident, I accept that the speed of train, at the time of the accident, was about 42 Kms. per hour.

14. *Effect of high Speed*—The restriction of 48 Kms. p.h. is imposed because the facing points have been provided with the minimum equipment necessary to allow a train at 50 Km. p.h. namely—

- (i) a key type lock;
- (ii) means of locking each switch independently through a split stretcher;
- (iii) means of preventing the points from being unlocked during the passage of trains; and
- (iv) A steel sleeper in lieu of gauge tie plate.

The locking arrangement thus provided is quite adequate even for speeds up to 75 Km. p.h. if, in addition detectors for the points and signals are provided. The method of locking is, therefore, not the factor limiting the speed over the points. Even if the train had travelled over the points at a higher speed than 48 Km. p.h., nothing untoward could have happened. However, in this case, the train was travelling at 42 m. p.h. and, therefore, the speed being the cause of accident can be ruled out.

15. *The Permanent Way*—(a) The permanent way was laid in May and June 1968. It consisted of 60 lbs RBS 12 meter rails welded in panels of 3 rails each laid on N+3 CST 9 sleepers with wooden sleepers at the joints. There was 6½" broken stone ballast under the sleepers. The points and crossings were of 60 lbs RBS rails laid on steel trough sleepers on 23-11-68. The portion where the accident occurred was attended to by the gang in January 1969. On the day of the accident, no work was being done at the points by the gang or the signal staff. It was inspected by the keyman that morning and nothing wrong was noticed at the site. It was inspected by the Permanent Way Inspector on 13th & 14th March by foot plate and on 27th March by trolley and on all these occasions, he found the permanent way to be satisfactory. Assistant Engineer inspected the permanent way at the site of the accident on 9-3-69 by motor trolley and on 23-3-69 by foot plate and on both the occasions, he found nothing that required attention.

(Assistant Engineer's diary was verified and this was found to be correct).

The permanent way was inspected for over half a mile to the rear of the point of derailment. It was found that the packing was good and there was no indication that the permanent way was not up to the required standard in any respect.

The train crew of two previous trains—one in the trailing direction and the other in the facing direction which passed over these points after the ballast train, felt no rough running or jerk at these points.

(b) The points lock mechanism was inspected by Assistant Block Inspector on 7-3-69. The Assistant Signal Inspector inspected the lock, the plunger, the stretcher bars, the rodding, the rank and the lever, on 7-3-69 and again on 25-3-69 and found everything in order on both occasions. Before that

on 14-2-69, he had opened, cleaned and refitted the lock. District Signal & Telecommunication Engineer inspected the points on 7-7-69 and carried out the obstruction test. Even after the accident, the lock was minutely examined by the Chief Signal & Telecommunication Engineer, the Deputy Chief Signal & Telecommunication Engineer and myself and it was found to be in good working order.

(c) The token exchanger and the key transmitter at site were also examined in detail and were found to be functioning correctly.

(d) The signal and block failure and the inspection registers were checked. It was found that there had been no defect or failure noted at the points since they were laid.

(e) Taking all this into consideration, I conclude that neither the permanent way nor the points nor the locking arrangements at the points in any way caused or contributed to the derailment.

16. *The Engine and the Coaches*—(a) The engine was commissioned on 31-7-68. It had received its 'E' scheduled attention on 29-12-68 when it had done 50,209 Kms. The 'E' schedule was slightly deferred on account of the pressure of work as well as the good condition of the engine. It had received its last 'C' schedule on 23-3-69, and its boiler wash out on 28-3-69. This engine is a nominated engine for Jodhpur Mail and is worked by three drivers only. All the engine repairs booked from time to time had been promptly attended to as was evident from the examination of the engine repair books. The repeated bookings register was checked and it was found that there were no significant repeated bookings which could render the engine unroadworthy. It had no sharp or deep flanges. The detailed examination of the engine did not reveal any defect which could have caused the accident.

(b) The coaches had received their P.O.H. on due dates and none of them was overdue P.O. H. They had received their secondary maintenance at Delhi on 27th and whatever minor attention was necessary, was given. They had received their primary maintenance attention at Jodhpur on the 29th and the necessary minor repairs were carried out. The examination of the daily damage returns showed that only some minor adjustments of the brake gears were necessary and that they had been carried out. None of the coaches had a sharp or a deep flange. The axle box clearances were well within permissible limits and none of the brake gear showed any defect not attributable to the accident. Taking all these factors into consideration, I am of the opinion that neither the engine nor the coaches, in any way, caused or contributed to the accident.

(c) The stock on the ballast train which passed over these points at about 17.45 hours on 29-3-69 was examined and it was found that there was nothing on any of the stock which could have damaged the points leading to this derailment. Similarly, the stock of J-4 Down Goods consisting of 25 four wheelers and 8 bogie wagons which passed over the points in the facing direction at about 19.25 hours on 29-3-69 was also examined and nothing was found to indicate that any of the wagons on this train could have caused any damage to the points that might have led to this derailment. Considering all these aspects, I feel that the points mechanism was in good working order till J-4 Down Goods; the train prior to 94 Down, passed over these points.

17. *Could the siding points have been left unlocked by the guard of the ballast train*—It was possible that when the ballast train came out, the guard might have found that he was unable to extract the key from the hand plunger lock even after setting and locking the points for the main line. He might, therefore, have removed the cover, unlocked points and taken the key out, inserted it in the token exchanger, extracted the token and taken the ballast train to Talchhappar station leaving the points unlocked. The catch box of the lever also might have been left improperly honed and it might have got itself disengaged later on due to the vibrations set up by the subsequent trains—1JRM Up Passenger & J-4 Down Goods. The ballast train guard asked for permission to enter the block section at 17.32 hours, which he was given at 17.35 hours. The ballast train left the site at 17.45 hours reaching Talchhappar at 18.05 hours. In the interval of 10 minutes, if it is assumed that he has left the points unlocked he had to do a number of operations viz; remove the key from the token exchanger, unlock the points, reverse the cross-over points and set them for the ballast siding, bring the ballast train on the main line, again reverse the cross-over points setting them for the main line, lock the points, make an attempt to take out the key, find that this was not possible, obtain necessary tools to unscrew the points lock cover probably from the driver, unscrew the cover, remove the locking piece, take out the key, fit the locking piece in the unlocked position, turn the operating piece, screw the cover on and start

the train. For doing all these operations, the time of 10 minutes is inadequate. Such an operation would take at least half an hour. It will also have to be assumed that 1 JRM Up Passenger train has passed these points in the trailing direction without any mishap in spite of the points being unlocked. This is possible. Again it will have to be assumed that J-4 Down Goods train comprising 25 four-wheelers and 8 bogie wagons also passed without any mishap, in the facing direction. This does not seem to be probable. Therefore, the possibility that the guard had left these points unlocked has to be discarded. Moreover, he had also given an assurance in writing that the main line points have been correctly set, immediately on arrival at Telchhapar.

18. *Interference with the track*—(a) The Assistant Mechanical Engineer, who was travelling in the train saw the points about half an hour after the accident and found that there was a gap in the left tongue and stock rail. The key of the points lock was locked up in the token exchanger. The interlocking arrangement of the points was such that in normal working the key could be taken out from the points lock and placed in the token exchanger only when the points were set and locked for the main line. Later on, in the presence of the General Manager, the key was removed from the token exchanger and an attempt was made to insert the key in the points lock, but as the points were unlocked, the key could not be inserted. It was not possible to approach the lock from the facing direction even by creeping due to the inadequate gap between the undergear of the derailed bogie of GT 2620 and the approach sleepers of the points. Any interference with the points or the lock, after the accident, therefore, has to be ruled out.

(b) After the derailed coach, GT 2620, was removed, the points were examined and the lock was opened in my presence. When the lock was opened, it was found that the locking piece was in an unlocked position and the operating piece had been turned to the position consistent with it. Experiments were conducted to ascertain if the points could get unlocked and the operating piece turned to the unlocked position by any effect of the accident and it was found that no amount of force applied either to the key or to the plunger in any direction could bring about this condition. The only results were the breakage of the key or the lock casting but the locking piece remained in the locked position and the operating piece in a position consistent with it. The examination of the lock showed that none of its working parts were damaged or worn out. This, therefore, necessarily leads to the conclusion that it must have been deliberately interfered with to bring about the conditions of the lock as were seen immediately after the accident. For this, all that is necessary is to unscrew the nuts holding the lock cover, remove the lock cover, remove the locking plunger and refit it in the unlocked position, turn the operating piece and re-fix the cover, the plunger can then be pulled and the points unlocked. The lever can now be released by lifting the catch box and left floating on the quadrant thus creating a gap in the point. This would enable wheel flanges to take a route between the two switches and the stock rails, thus leading to derailment. The fact that the tip of the switches have suffered no damage, the switches were only very slightly bent, the flange marks on the mild steels tops fixed to the stock rails, the damage to the distance blocks of the switches, the rubbing mark on the non-running side of the switches, and on the inside of the wheel flanges, all indicated that the points must have been gaping with the points unlocked when 94 Down negotiated them. The damage to the quadrant of the single lever indicated that the catch box was lifted and the lever was left floating on the quadrant. The driver of 94 Down stated that the engine simply went down at the moment of derailment and did not rise and drop. These factors further corroborate that there was a gap between the tongue and stock rails prior to the accident.

(c) The interference with the points, as indicated above, and the creation of a gap between the stock and the tongue rails, would require a fairly intelligent person conversant with the lock and equipped with a suitable spanner, about 3½ minutes. The last train to pass over this section was No. J-4 Down Goods which also approached the points from the facing direction. It must have passed over these points at about 19.25 hours. The derailment occurred at 20.50 hours. There was thus a clear gap of one hour and twenty-five minutes between the two trains which is more than sufficient for causing the interference with the points as indicated. A road runs parallel to the track at this point at a distance of 200 feet, giving an easy approach to the site by the road. The area surrounding the points is a sandy desert and the nearest village is about five kilometres away. Further, anybody interfering with the track, could not have been noticed due to the nature of the surroundings. The situation was, therefore, suitable for an act of sabotage.

VII. CONCLUSION.

19. *Cause*—Taking into consideration all the evidence and the tests conducted, I have come to the conclusion that the derailment of No. 94 Down Jodhpur Mail at Km 350 between Talehhapar and Parhihara stations at 20.50 hours on 29-3-69 was the result of a deliberate act of tampering with the points lock by some person or persons unknown. The points lock was unlocked by removing the lock cover, resetting the locking piece and turning the operating piece to unlocked position. The cover was then refitted. The hand plunger was pulled unlocking the points, the catch box of the lever was lifted and the lever was left floating on its quadrant, thus creating a gap between either tongue and stock rail.

20. *Responsibility*—(a) During the night, it is not possible for a driver of an approaching train to notice in the head light a gap between the tongue and the stock rail. I do not consider that Ishwari Prasad, the driver of 94 Down, could have spotted the gap between the tongue and the stock rail and, therefore, do not hold him responsible for not avoiding the derailment.

(b) There has been no case of tampering with the track in Ratangarh-Degana section for over ten years. There had been no necessity for introducing security patrol in this area except on the occasion of the political agitation in connection with 'Rajasthan Bund' from 27th to 30th March, 1966. The Civil or Police authorities have not indicated that this area is vulnerable and liable to sabotage. No security patrolling was therefore in force under the circumstances no responsibility lies with the Railway Administration for not providing security patrolling in this area.

(c) The accident may be due to an anti-social act on the part of some disgruntled railway employee. It is ascertained that within 25 miles radius of Ratangarh, there are 151 permanent staff under suspension and 85 temporary staff whose services have been terminated due to their participation in the Central Government Employees Strike on the 19th September, 1968. In fact, I understand that one such employee tried to rob the cash chest by cutting the bolt with a hack-saw between Churu and Ratangarh on the 3rd April. There is also a possibility that the act might have been done by some other anti-social person or an enemy agent.

21. *Relief Measures*—Immediately after the accident, the guard took the stock of the situation and contacted the control over the portable telephone. On receipt of the information, arrangements were made to despatch medical aid from Ratangarh which reached the site within two hours of the accident. In the mean while first aid was given by three doctors and a nurse who were travelling in the train. I consider that the relief measures were prompt and satisfactory. The work done by the three doctors and a nurse, who were travelling in the train, is commendable.

22. *Remarks and Observation*—(a) It was observed that the points lock was not rivetted or otherwise suitably secured against unauthorised interference as required in para 169 of the Indian Railway Signal Engineering Manual which reads as under:—

"All bolts, studs, pins, etc., of apparatus used for locking and control of siding points shall be rivetted over or otherwise suitably secured against interference by unauthorised persons".

Similar condition is also laid down in section 6 of Chapter VIII of the Rules for the Opening of a Railway. It is, therefore, considered necessary that this should be done at all the points provided with similar locks. It was also observed that no padlock was provided on the lever operating the points. It is desirable that such levers should be provided with padlocks. In addition, at all outlying points, it is also desirable to cotter bolt and padlock the points themselves. All these precautions, however, will not prevent a determined person from an act of sabotage but will make it a little more difficult.

(b) It was observed that no emergency lighting equipment was available on 94 Down Jodhpur Mail as has been approved by the Railway Board vide their letter No. 57/EQ/BV/Elect dated 27-8-60. It is necessary that the lighting equipment should be provided on the trains, as accepted by the Railway Board.

(c) The accident once again emphasises the role of anti-teleopic coaches in reducing the number of casualties in such accidents.

Yours faithfully,

(Sd.) C. R. SUJE

Addl. Commissioner of Railway Safety,
Northern Circle, Lucknow-7.

LUCKNOW,
DATED 21-5-1969

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